A NEW GENUS OF RUTITRIGONIINAE (BIVALVIA, TRIGONIACEA) FROM THE LOWER CRETACEOUS (APTIAN) OF ZULULAND

By

Michael R. Cooper
Department of Geology, University of Durban-Westville, Natal

(With 1 figure)

[*MS accepted 12 September 1989*]

ABSTRACT

Trigonia (Rutitrigonia) pongolensis Rennie lacks the characters of *Rutitrigonia*, and is made the type species of the new genus *Zulutrigonia*. Other species to be referred here include *T. krenkeli* Lange and *T. kigombana* Aitken from the Neocomian–Aptian of Tanzania.

CONTENTS

INTRODUCTION

In a benchmark paper representing a marked departure from the conservative taxonomy of that period, Van Hoepen (1929) introduced a number of subfamilies and genera for trigoniid bivalves from the Cretaceous of Zululand. Among these was the genus *Rutitrigonia*, introduced for *R. peregrina* van Hoepen from the upper Middle or low Upper Albian. This taxon formed the basis for the monogeneric subfamily Rutitrigoniinae van Hoepen, corresponding broadly with the Excentrica group of Lycett (1879).

Van Hoepen's (1929) bold taxonomy failed to make immediate impact, and *Rutitrigonia* was reduced to a subgenus of *Trigonia* by Rennie (1936), whereas Cox (1952) and Aitken (1961) treated it as a subgenus of *Megatrigonia*. However, Crickmay (1932), Kobayashi (1957), Saveliev (1958), Nakano (1961, 1963, 1965, 1977), Cox (1969), Poulton (1977, 1979) and Reyes & Pérez (1978) have all used *Rutitrigonia* as a valid genus, and it is now widely accepted.

In addition to the type species, the following species have also been assigned to *Rutitrigonia*: *R. affinis* (Sowerby), *R. agrioensis* (Weaver), *R. amagensis* (Kobayashi), *R. beyrichi* (Krumbeck), *R. beyschlagi* (Müller), *R. bornhardti* (Müller),

Ann. S. Afr. Mus. **99** (3), 1990: 23–29, 1 fig.

R. coquandiana (d'Orbigny), *R. dietrichi* (Lange), *R. dunscombensis* (Lycett), *R. excentrica* (Parkinson), *R. jacksonensis* (Packard), *R. janenschi* (Lange), *R. kigombana* (Aitken), *R. laeviuscula* (Lycett), *R. lerchi* (Hill), *R. longa* (Agassiz), *R. mesembris* (Tenison-Woods), *R. niongalensis* (Lange), *R. nossae* Aitken, *R. nyangensis* Aitken, *R. pongolensis* (Rennie), *R. sanchuensis* (Nakano), *R. schwarzi* (Müller), *R. semiculta* (Forbes), *R. skorkovensis* Pugaczewska, *R. syrdariensis* (Archangelsk'ii), *R. weaveri* (Stoyanow), and *R. yeharai* Kobayashi.

In introducing the new species *Trigonia (Rutitrigonia) pongolensis*, Rennie (1936: 358) noted that '. . . It is not without some hesitation that I associate with *Rutitrigonia* the species *T. pongolensis* sp. nov. and *T. krenkeli*. The concentric ribbing of the neanic stage is of such a character in both these species as to exclude them from *Indotrigonia* in spite of adult similarities, and *Rutitrigonia* is the only term available for species of *Trigonia* having features at all like those of the last two species.'

Nakano (1963) excluded *Trigonia (Rutitrigonia) pongolensis* Rennie from his concept of *Rutitrigonia* because of its coarse oblique flank costae, referring it instead to *Megatrigonia*. Subsequently, he identified it (Nakano 1965) as *Megatrigonia? pongolensis* (Rennie).

Given the large number of *Rutitrigonia* species now known, it is clear that *Trigonia pongolensis* and its allies can no longer be accommodated satisfactorily in this genus. It is proposed, therefore, to introduce a new genus for these forms.

SYSTEMATIC DESCRIPTION

Superfamily TRIGONIACEAE Lamarck, 1819

Family **Trigoniidae** Lamarck, 1819

Subfamily Rutitrigoniinae van Hoepen, 1929

Diagnosis

Shell small to moderately large, subovate to pyriform, subtrigonal and subtrapezoidal. Typically with inner and marginal carina lacking, resulting in poor discrimination between the smooth escutcheon and area. The latter is ornamented only in the nepionic stages and may be weakly bipartite. In some taxa there is a more or less prominent umbonal ridge. Nepionic ornament comprises concentric costae that pass uninterrupted on to the area where they weaken across the longitudinal furrow. Later flank ornament comprises costae that are subconcentric anteriorly, but posteriorly may be subconcentric, strongly oblique, or effaced.

Discussion

The origins of *Rutitrigonia* are cryptic. It first appears in the Bathonian of East Africa (Venzo 1942), and its ancestry has been linked to the myophorelline *Frenguelliella* (Kobayashi 1957; Nakano 1963). However, it seems to be Gon-

dwanic in origin and there is a noteworthy similarity with primitive *Anditrigonia* species such as the Lower Callovian *A. keideli* (Weaver) (*cf.* Leanza & Garate, 1987, pl. 3 (fig. 1)). Like Van Hoepen (1929) and Cox (1952), the writer considers the Megatrigoniinae and Rutitrigoniinae to be closely allied; they are here regarded as sister taxa.

Genus ***Zulutrigonia*** gen. nov.

Type species. Trigonia (Rutitrigonia) pongolensis Rennie, 1936; by original designation herein.

Diagnosis

Shell medium sized, subtrapezoidal, with inconspicuous subterminal umbones and opisthogyrous beaks. Anterior margin weakly convex, posterodorsal margin almost straight and respiratory margin obliquely truncate. Escutcheon narrow, indistinct, not sunken. Broad subtrigonal area essentially flat, meeting the posterodorsal commissure in an acute angle, so that the shell is fastigiate (roof-shaped) posteriorly. Ornament comprises coarse, robust, relatively sparse costae that are subconcentric anteriorly and curve strongly upwards posteriorly, cutting obliquely across the growth striae. Age: Lower Cretaceous (Neocomian–Aptian).

Discussion

Zulutrigonia gen. nov. is distinguished from *Rutitrigonia* by its subtrapezoidal outline, with subterminal umbones, almost straight posterodorsal margin and obliquely truncate siphonal margin. In addition, the shell is fastigiate posterodorsally, due to the broadly flattened areas meeting the commissure at an acute angle, and the coarse, robust flank costae curve strongly upwards posteriorly.

There are noteworthy similarities between *Zulutrigonia* gen. nov. and *Buchotrigonia* (*Syrotrigonia*) (Cox, 1952). Both are characterized by moderate inflation, subterminal umbones, a straight posterodorsal margin and obliquely truncate respiratory margin, an inconspicuous to near-obsolete escutcheon, and broad flattened areas that produce a strongly fastigiate profile to the shell posterodorsally. The concentric ornament of the nepionic and middle growth stages is identical. *Syrotrigonia* may be distinguished, however, by its more ovate outline, the possession of a marginal carina that becomes a tuberculate umbonal ridge in maturity, the presence of a broad shallow antecarinal sulcus in maturity across which ribbing weakens or is effaced, and the generally V-shaped costae of the adult. Significantly, however, the V-shaped costae are far from uniformly developed and in some individuals examined they simply bend strongly upwards as in *Zulutrigonia* gen. nov. Similarly, the strong marginal carina that was emphasized in the original diagnosis is not a true carina (the latter is restricted to the nepionic stages) but an umbonal ridge whose prominence is enhanced by the bounding antecarinal sulcus. Initially the tubercles on this ridge are no more than rib endings that are emphasized by the weakening of ornament across the antecarinal sulcus. Whether the similarities

are due to phylogeny or are the result of convergence is, at present, unclear. *Syrotrigonia* is here elevated to full generic status because *Buchotrigonia* has radial flank costae in the early to middle growth stages, an internally crenulated posteroventral margin and transverse costellae to the escutcheon (*cf.* Pérez & Reyes 1980), characters that ally it with the Apiotrigoniinae and Pterotrigoniinae.

Zulutrigonia pongolensis (Rennie, 1936)

Fig. 1A–E

Trigonia (Rutitrigonia) pongolensis Rennie, 1936: 359, pl. 41 (figs 5–6), pl. 42 (figs 5–7).
Megatrigonia (Rutitrigonia) pongolensis (Rennie) Cox, 1952: 59.
Megatrigonia pongolensis (Rennie) Nakano, 1963: 527.
Megatrigonia? pongolensis (Rennie) Nakano, 1965: 17.

Type material

The holotype, SAM–PCZ8528, and paratype, SAM–PCZ8529, both in the South African Museum, Cape Town.

Type locality

The material was collected by Drs S. H. Haughton and A. W. Rogers along the Mfongosi stream, a tributary of the Pongola, at their locality Z2. It is from the Mlambongwenya Formation (Cooper & McCarthy 1988), which here is of late Aptian age and corresponds broadly with Locality 164 of Kennedy & Klinger (1975).

Description

Shell medium sized (maximum length about 60 mm), longer than high (H/L = 0,73–0,80), subtrapezoidal, with low subterminal umbones and incurved opisthogyrous beaks. The valves are moderately inflated (W/L = 0,20–0,22) and maximum inflation is just behind the umbones. The broad, weakly curved anterior margin is subvertical and curves evenly into the long, almost straight, ventral margin. The broad, obliquely truncate respiratory margin meets the straight posterodorsal margin in a very obtuse angle. The dorsal and ventral margins are subparallel.

The smooth, narrow, flat, lanceolate escutcheon is poorly discriminated and can be distinguished from the area only in the nepionic stages when it is ornamented. Marginal and inner carinae are lacking, but an umbonal ridge marks the position of the marginal carina. The broad subtrigonal area is weakly concave, almost flat, and with an indistinct longitudinal groove. It forms an acute angle with the opposing area at the posterodorsal commissure so that the posterodorsal part of the shell is fastigiate (roof-shaped).

The ornament of the nepionic stages comprises coarse concentric costae, broader than the interspaces, which flex slightly at the umbonal ridge before crossing onto the area. The ribs thin noticeably where they cross the longitudinal groove. Later flank costae are coarse, robust, relatively distant and slightly

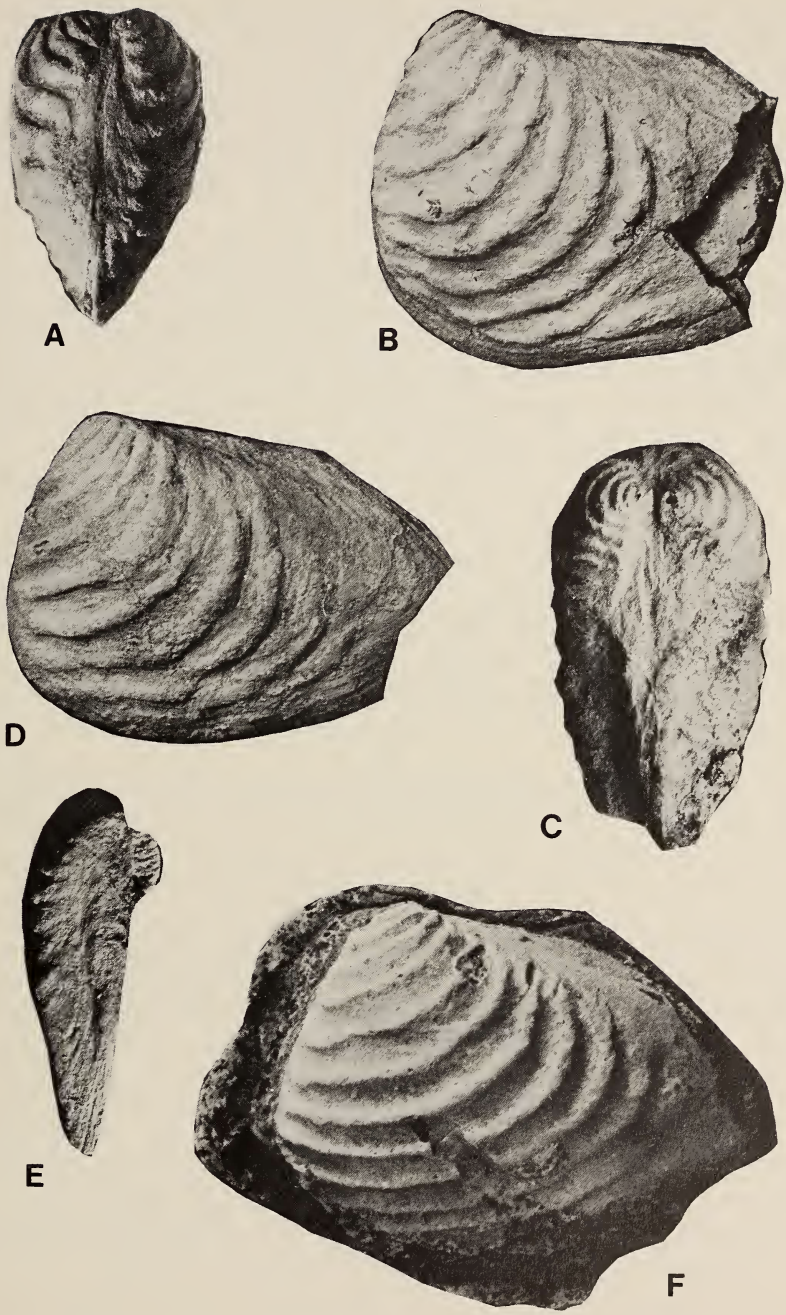

Fig. 1. A–E. *Zulutrigonia pongolensis* (Rennie). A–C. Anterior, lateral and dorsal views of the paratype, SAM–PCZ8529. D–E. Lateral and dorsal views of the holotype, SAM–PCZ8528. F. *Zulutrigonia krenkeli* (Lange). A plastercast of the holotype, in the South African Museum. All × 1.

narrower than the interspaces. They are subconcentric anteriorly but curve strongly upwards to the posterior, cutting the growth striae obliquely and approaching the area almost at right angles. In the middle growth stages the ribs terminate at the umbonal ridge but in maturity they weaken and become effaced before reaching the area. The flank costae become obsolete on the anterolateral shoulders, leaving the narrow anterior face crossed only by growth striae.

Discussion

Other species to be assigned to *Zulutrigonia* include the Tanzanian *Trigonia krenkeli* Lange (1914: 230, pl. 20 (fig. 2)) and *T. kigombana* Aitken (1961: 95, pl. 13 (fig. 3)), both from the *Rutitrigonia schwarzi* Beds of the Tendaguru succession and thus of Hauterivian age.

Zulutrigonia krenkeli (Lange) (1914: 230, pl. 20 (fig. 2)) (Fig. 1F) differs from *Z. pongolensis* in having dorsal and ventral margins that converge posteriorly and with a lower, less-fastigiate posterodorsal profile.

Zulutrigonia kigombana (Aitken) (1961: 95, pl. 13 (fig. 3)) differs from *Z. pongolensis* in being strongly produced posteriorly, with a gently concave posterodorsal margin, and with the posterior one-third of the flanks unornamented.

Trigonia inca Fritzsche (1921: 49, pl. 3 (figs 1–3)) from the Barremian of northern Peru shows some similarity to *Zulutrigonia*. However, its flank costae form distinct chevrons in maturity and hence it may be a *Syrotrigonia* (Etayo-Serna 1985; Pérez & Reyes 1986).

Occurrence

Zulutrigonia pongolensis (Rennie) is currently known only from the late Aptian of northern Zululand.

ACKNOWLEDGEMENTS

I thank Drs M. Tashiro (Kochi) and E. Pérez d'Angelo (Santiago) for their constructive criticism of the manuscript. Betsie Greyling assisted with the photography and the University of Durban-Westville is thanked for a grant in aid of publication.

REFERENCES

Aitken, W. G. 1961. Geology and palaeontology of the Jurassic and Cretaceous of southern Tanganyika. *Bulletin of the Geological Survey of Tanganyika* **31**: 1–144.

Cooper, M. R. & McCarthy, M. J. 1988. The stratigraphy of the Uloa Formation. *Extended Abstract, Geocongress '88*, Durban: 121–124. Durban: Geological Society of South Africa.

Cox, L. R. 1952. Notes on the Trigoniidae, with outlines of a classification of the family. *Proceedings of the Malacological Society of London* **29** (2–3): 45–70.

Cox, L. R. 1969. Trigoniacea Lamarck, 1859. *In:* Moore, R. C. *ed. Treatise on invertebrate paleontology*. Part N, Mollusca **6** (1): N471–N489. Boulder: Geological Society of America; Lawrence: University of Kansas.

Crickmay, C. H. 1932. Contributions toward a monograph of the Trigoniidae. *American Journal of Science* **24** (5): 443–464.

ETAYO-SERNA, F. 1985. Paleontología estratigrafica del sistema Cretácico en la Sierra Nevada del Cocuy. *Publicaciones Especiales Ingeominas, Colombia, No. 16, Proyecto Cretácico, Capítulo* **24**: 1–47.

FRITZSCHE, C. H. 1921. Neue Kreidefaunen aus Südamerika (Chile, Bolivia, Perú, Colombia). *In:* STEINMANN, G. *ed. Beiträge zur Geologie und Paläontologie von Südamerika. Neues Jahrbuch für Mineralogie, Geologie und Paläontologie* **50**: 1–56, 313–334.

KENNEDY, W. J. & KLINGER, H. C. 1975. Cretaceous faunas from Zululand and Natal, South Africa. Introduction, stratigraphy. *Bulletin of the British Museum of Natural History* (Geology) **25** (4): 265–315.

KOBAYASHI, T. 1957. *Nipponitrigonia* and *Rutitrigonia* in Japan. *Transactions and Proceedings of the Palaeontological Society of Japan* (n.s.) **26**: 51–61.

LANGE, E. 1914. Die Brachiopoden, Lamellibranchiaten und Anneliden der *Trigonia schwarzi*-Schicht, nebst verleichender Übersucht der Trigonien der gesamten Tendagur-uschichten. *Archiv für Biontologie* **3** (4): 193–289.

LEANZA, H. A. & GARATE, J. I. 1987. Faunas de Trigonias (Bivalvia) del Jurásico y Cretácico Inferior de la Provincia del Nequén, Argentina, conservadas en el Museo Juan Olsacher de Zapala. *In:* VOLKHEIMER, W. *ed. Bioestratigrafía de los Sistemas Regionales del Jurásico y Cretácico de América del Sur* **1**: 201–255. Mendoza.

LYCETT, J. 1872–79. A monograph of the British fossil trigoniae. *Monograph of the Palaeontological Society*: 1–52 (1872); 53–92 (1874); 93–148 (1875); 149–204 (1877); 205–245 (1879).

NAKANO, M. 1961. On the Trigoniinae. *Journal of Science of the Hiroshima University* (C, Geology and Mineralogy) **4** (1): 71–94.

NAKANO, M. 1963. On the Rutitrigoniinae. *Geological Report of the Hiroshima University* **12**: 513–529.

NAKANO, M. 1965. On the Megatrigoniinae. *Journal of Science of the Hiroshima University* (C, Geology and Mineralogy) **5** (1): 13–20.

NAKANO, M. 1977. A new genus *Levantotrigonia* nov. gen. *Journal of Science of the Hiroshima University* (C, Geology and Mineralogy) **7** (4): 199–202.

PÉREZ, E. & REYES, R. B. 1980. *Buchotrigonia (Buchotrigonia) topocalmensis* sp. nov. (Trigoniidae; Bivalvia) del Cretácico superior de Chile. *Revista Geológica de Chile* **9**: 37–55.

PÉREZ, E. & REYES, R. B. 1986. Presencia de *Buchotrigonia (Syrotrigonia)* Cox, 1952 (Bivalvia; Trigoniidae) en Sudamérica y descripcion de dos especies nuevas. *Revista Geológica de Chile* **28–29**: 77–93.

POULTON, T. P. 1977. Early Cretaceous trigoniid bivalves of Manning Provincial Park, southwestern British Columbia. *Geological Survey Paper. Mines and Geology Branch, Canada* **76–9**: 1–25.

POULTON, T. P. 1979. Jurassic trigoniid bivalves from Canada and the western United States of America. *Bulletin. Geological Survey of Canada* **282**: 1–82.

RENNIE, J. V. L. 1936. Lower Cretaceous Lamellibranchia from northern Zululand. *Annals of the South African Museum* **31** (3): 277–391.

REYES, R. B. & PÉREZ, E. 1978. Las trigonias del titoniano y cretácico inferior de la cuenca andina de Chile y su valor cronoestratigráfico. *Boletin de Instituto de Investigaciones Geológicas de Chile* **32**: 1–105.

SAVELIEV, A. A. 1958. The Lower Cretaceous trigoniids of Mangyschlak and western Turkmenia. *Trudy Vsesoyuznogo neftyanogo nauchno-issledovatel'skogo geologorazved-ochnogo instituta (VNIGRI)* **125**: 1–516. (In Russian.)

VAN HOEPEN, E. C. N. 1929. Die krytfauna van Soeloeland. 1. Trigoniidae. *Paleontologiese Navorsing van die Nasionale Museum van Bloemfontein* **1** (1): 1–38.

VENZO, S. 1942. *Trigonia (Laevitrigonia) stefaninii* n. sp. del Batoniano dell'Oltregiuba. Revisione del sottogenere e sua distribuzione. *Atti della Societè italiana di scienze naturali, e del Musei civico di storia naturale* **81** (3–4): 210–229.